

MARINE TUBIFICIDAE (OLIGOCHAETA) FROM
PUERTO RICO WITH DESCRIPTIONS OF TWO
NEW SPECIES, *TUBIFICOIDES AGUADILLENSIS*
AND *HETERODRILUS PAUCIFASCIS*

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Abstract. — Five species of Tubificidae were collected during a study of benthic infauna off the west coast of Puerto Rico. Two species are new to science and described as *Tubificoides aguadillensis* and *Heterodrilus paucifascis*. One partially mature specimen of *Heterodrilus* sp. A is described and is the first record of a member of this genus outside the South Pacific possessing setae with subdental ligaments. Two marine species, *Duridrilus tardus* Erséus, 1983b, and *Tubificoides wasselli* Brinkhurst and Baker, 1979, are newly reported from Puerto Rico, and compared with the original descriptions.

Little information is available concerning marine Tubificidae from the Caribbean. Brinkhurst (1965, 1966), Righi and Kanner (1979), Erséus (1981a, b, 1983a, b), and Erséus and Baker (1982), are the only authors who have reported on tubificid specimens collected from this region. From these studies, only four species have been identified from Puerto Rico.

Brinkhurst (1965) described two specimens from Puerto Rico that he designated as “?*Spiridion insigne* Knöllner, 1935.” Erséus (1979) concluded from Brinkhurst’s description that this form actually may be more closely related to *Bathydrylus adriaticus* (Hrabe 1971a). Further examination of Brinkhurst’s specimens is necessary before a final determination can be made.

Righi and Kanner (1979) described a new species, *Marcusaedrilus hummelincki*, from a sandflat with *Thalassia* and *Halimeda* in southwest Puerto Rico. This species has subsequently been reported from Bermuda, southeast Florida, and throughout the Caribbean in intertidal and subtidal muds and sands to a depth of 21 m (Erséus 1983a).

Two species of *Thalassodrilides* were reported from Puerto Rico by Erséus (1981a). *Thalassodrilides gurwischii* (Hrabe 1971b)

and *T. belli* (Cook 1974) were collected in mud samples from an enclosed brackish-water lagoon (salinities 8–44‰) in western Puerto Rico. The former species was also collected from an estuary in northeast Puerto Rico and is common throughout the Caribbean and Europe. *Thalassodrilides belli* has been reported from both coasts of North America and the Gulf of Mexico.

Additional species of Tubificidae were collected during a recent study of invertebrate fauna off the west coast of Puerto Rico. Two species, one *Tubificoides* and one *Heterodrilus*, are new to science and are described here. Because of the unique setae, the description of one partially mature specimen within the genus *Heterodrilus* is included as *Heterodrilus* sp. A. Taxonomic notes are provided for two other species for geographic comparison. Species in the subfamily Limnodriloidinae will be described by Erséus and Milligan (in preparation).

Material and Methods

Samples were collected by Dr. Allan Stoner for the Center for Energy and Environmental Research at the University of

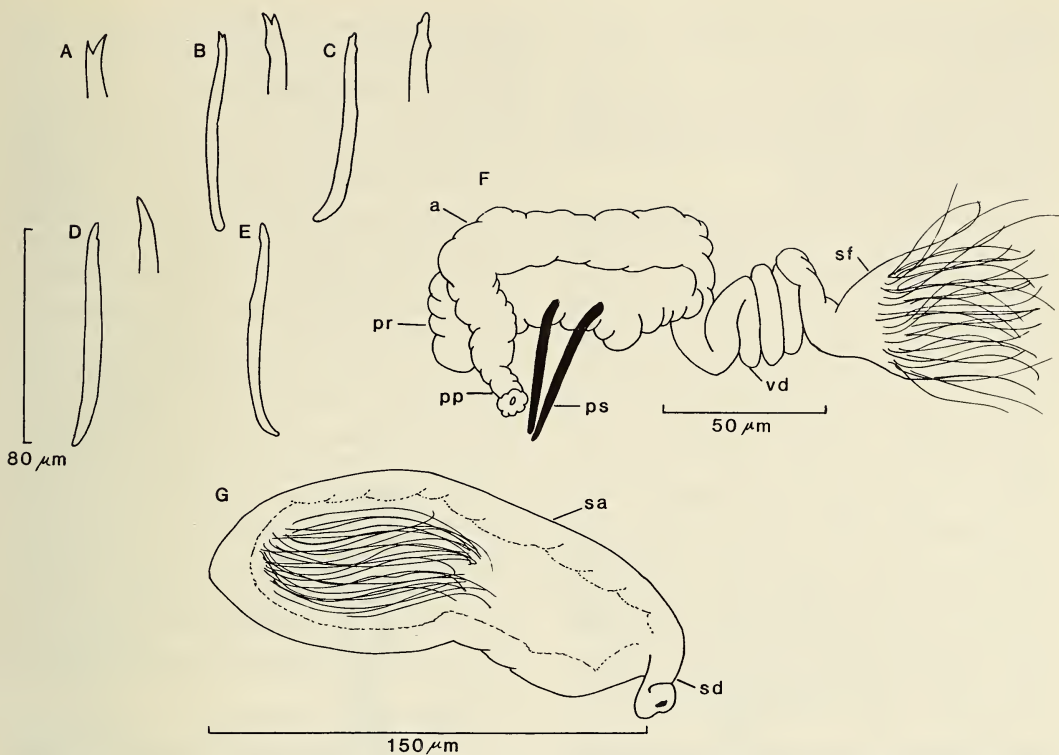


Fig. 1. *Heterodrilus paucifascis*: A, Seta from VII; B, Seta from VIII; C, Seta from IX; D, Seta from X; E, Posterior seta; F, Male genitalia; G, Spermatheca.

Puerto Rico from Aguadilla and Mayaguez Bays off the west coast of Puerto Rico using a Van Veen grab. The samples were fixed in formalin and subsequently sieved through a 0.5 mm screen. The worms were removed from the residue and preserved in 70% isopropyl alcohol. Mature oligochaetes were temporarily mounted in glycerin, then stained in Grenacher's alcohol borax carmine, dehydrated, cleared in terpineol, and permanently mounted in Canada balsam. Representative specimens of all species have been deposited at the National Museum of Natural History (USNM), Washington, D.C. Length and width measurements in the descriptions refer to fixed, whole-mounted specimens. Segment number is referred to by Roman numeral.

Abbreviations used in figures are as follows: a, atrium; apr, anterior prostate; cps,

cuticular penis sheath; pp, pseudopenis; ppr posterior prostate; pr, prostate; ps, penial setae; sa, spermathecal ampulla; sd, spermathecal duct; sf, sperm funnel; st, sperm trap; vd, vas deferens.

Subfamily Rhyacodrilinae
Heterodrilus Pierantoni, 1902
Heterodrilus paucifascis, new species
 Fig. 1

Holotype.—Whole-mounted specimen, west coast of Puerto Rico. Aguadilla Bay, 2 km from shore, 39 m depth; coarse sand and shell, coll. Allan Stoner; 18 Apr 1985, USNM 101443.

Paratype.—Two whole-mounted specimens, type locality, USNM 101444–101445.

Other material examined.—One whole-

mounted specimen, type locality, author's collection.

Etymology.—*Pauci*, Latin, few; *fascis*, Latin bundle, referring to the fewer number of anterior bisetal bundles than in most other species in this genus.

Description.—Three specimens complete with up to 56 segments. Length 3.3–6.3 mm, width at clitellum 0.15–0.20 mm. Clitellum extending over ½X–XII. Setae 2 per bundle in II–VIII, bifid with short divergent teeth, upper tooth shorter and thinner than lower, to 82 μm long and 4 μm wide (Fig. 1A). Thereafter “bundles” unisetal. In VIII, upper tooth becoming more reduced, and indistinct third tooth or swelling, developing subdistally (Fig. 1B). Swelling more prominent on the setae of IX and upper tooth rudimentary (Fig. 1C). All setae from X similar, bluntly pointed with small subdistal swelling (Fig. 1D–E), to 80 μm long, 4 μm wide. Penial setae simple pointed, 2 per bundle, 43–52 μm long, 4 μm wide. Spermathecal pores located anteriorly in X and slightly ventral to the lines of ventral setae. Male genitalia paired. Sperm funnel large, entering into tightly coiled vas deferens of indeterminate length, 10 μm wide. Atrium “c-shaped,” 135 μm long and 20 μm wide, lobed prostate attached ventrally along entire length, terminating in small pseudopenis (Fig. 1F). Spermathecae paired. Spermathecal duct short 25 μm long, 22 μm wide leading into large thick-walled saciform ampulla (Fig. 1G), 150 μm long, 60 μm wide. Sperm arranged in random masses.

Remarks.—*Heterodrilus paucifascis* is the only species within this genus possessing bisetal bundles with only bifid setae in II–VIII, and unisetal “bundles” beginning in IX. The unisetal “bundles” of *Heterodrilus maccaini*, recently described by Erséus (1985), may begin in either VIII or IX, and those of *Heterodrilus pentcheffi* Erséus, 1981 may begin in IX–XIII, but both species possess trifold setae anteriorly. The unisetal bundles of all other species of *Heterodrilus* begin in X or XI. *Heterodrilus subtilus* (Pieriantoni 1917), *H. hispidus* Erséus, 1986 and *H.*

jamiesoni Erséus, 1981b are the only other species within this genus with bifid setae anteriorly and a tightly coiled vas deferens. However, *H. subtilus* and *H. hispidus* differ from *H. paucifascis* in totally lacking trifold setae. The present material is very similar to *H. jamiesoni* described from the Great Barrier Reef in the South Pacific. The form of the male genitalia is virtually identical, but *H. paucifascis* possesses a distinct spermathecal duct which is inconspicuous in *H. jamiesoni*. Both species possess similar setal morphology; however, the subdistal swelling on the setae of *H. jamiesoni* begins in V (not until VIII in *H. paucifascis*), and is much more pronounced on the setae of the post-clitellar segments. The new material also has a similar general setal morphology to *Heterodrilus occidentalis* Erséus, 1981b, but lacks the “m-shaped” atrium, trifold anterior setae, and posterior simple setae of the latter.

Habitat and distribution.—Coarse sand, 39 m depth, known only from Aguadilla Bay, Puerto Rico.

Heterodrilus sp. A

Fig. 2

Material examined.—One whole-mounted specimen, west coast of Puerto Rico. Aguadilla Bay, 1.5 km from shore, 17 m; coarse sand, coll. Allan Stoner, 18 Apr 1985, USNM 101446.

Description.—Specimen complete with 72 segments. Length 7.5 mm, width at XI 0.19 mm. Setae 2 per bundle in II–IX, 62–91 μm long and 3 μm wide, trifold with teeth nearly equal in length, upper tooth thinnest, middle tooth slightly thicker and lower tooth thickest with thin ligament connecting it to shaft (Fig. 2A). Posterior from IX somatic setae bifid (Fig. 2B), and only one representing each bundle, to 82 μm long and 5 μm wide, ligament absent, lower tooth gradually reduced (Fig. 2C). Penial setae unidentate, 2 per bundle, 90 μm long and 5 μm wide at base (Fig. 2D).

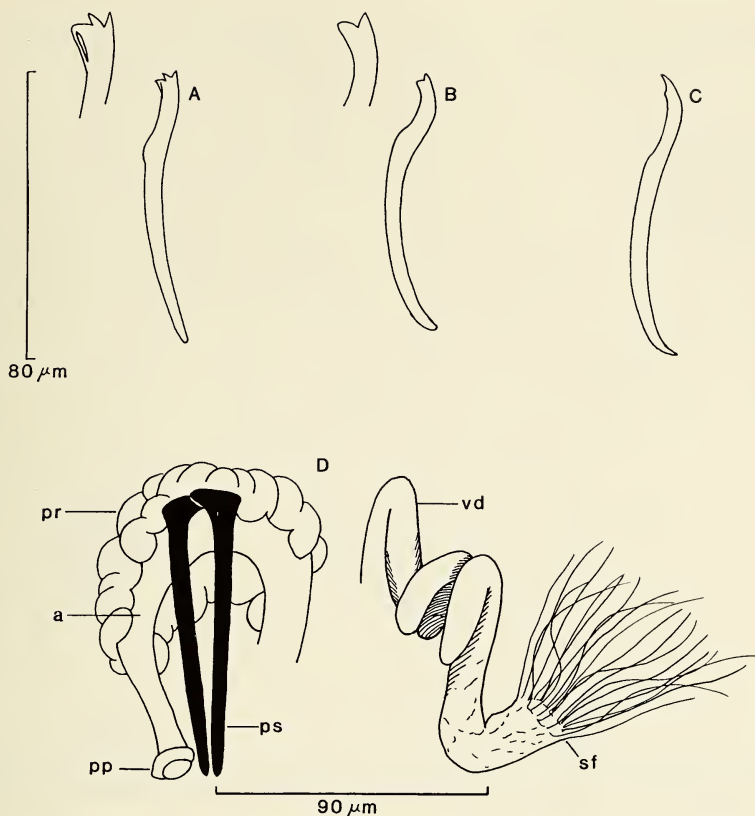


Fig. 2. *Heterodrilus* sp. A: A, Seta from VIII; B, Seta from IX; C, Posterior seta; D, Male genitalia.

Coelomocytes abundant, large and granulated. Male genitalia paired (Fig. 2D). Sperm funnel large, vas deferens tightly coiled, 10 μm wide. Atrium convoluted, 20 μm wide, globular prostate attached ventrally along entire length, narrowing ectally and terminating in pseudopenis. Spermathecae not observed.

Remarks.—This specimen from Puerto Rico is most similar to the original description of *H. pentcheffi* Erséus with respect to the tightly coiled vas deferens, narrow ectal region of the atrium, and morphology of the posterior setae. The exact configuration of the atrium was difficult to determine in the single specimen examined; however, Erséus (1981b) described the atrium of *H. pentcheffi* as “m-shaped.” The major difference between the present form and *H. pentcheffi* is the presence of a thin ligament connecting

the lower tooth to the shaft of the anterior trifid setae in the material from Puerto Rico. Although five species of *Heterodrilus* possess this characteristic type of aberrant setae, they also have this subdental ligament present in the posterior bifid setae as well, and possess an uncoiled vas deferens. The presence of the ligament, to date, has only been described in species collected from the South Pacific. Although the present specimen cannot be fully described, it is important to note this setal form in a species of *Heterodrilus* from the Atlantic. Until additional specimens can be examined and the exact morphology of the atrium and spermathecae can be determined, the specific designation is best left questionable.

Habitat and distribution.—Coarse sand, 17 m depth, known only from Aguadilla Bay, Puerto Rico.

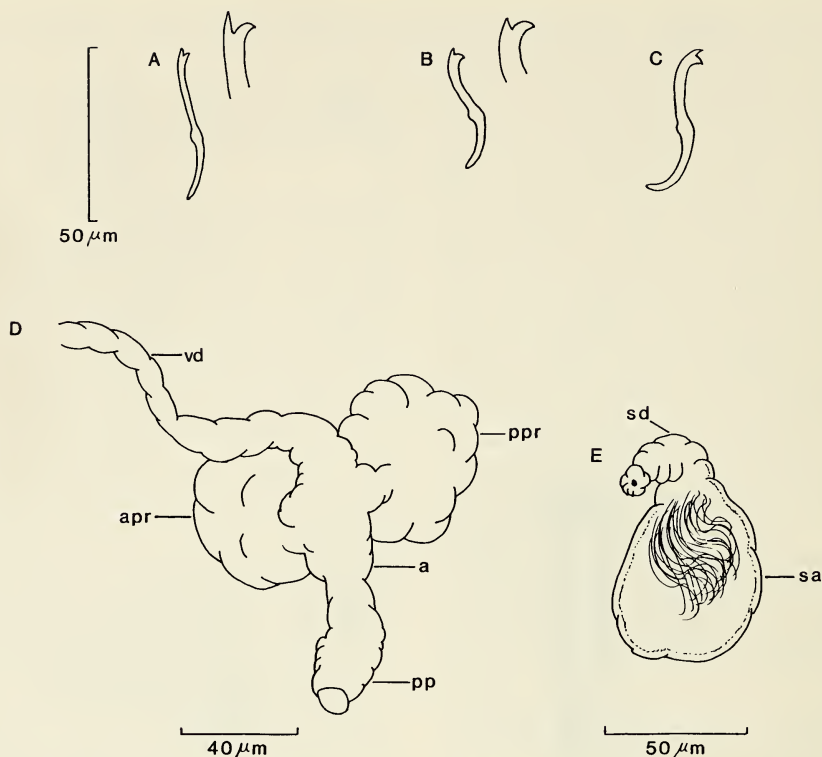


Fig. 3. *Duridrilus tardus*: A, Seta from V; B, Seta from X; C, Posterior seta; D, Male genitalia; E, Spermatheca.

Subfamily Phallodrilinae

Duridrilus Erséus, 1983

Duridrilus tardus Erséus, 1983

Fig. 3

Duridrilus tardus Erséus, 1983b:29–32, figs. 1–2.

Material examined.—Three whole-mounted specimens, west coast of Puerto Rico. Aguadilla Bay, 2 km from shore, 38.8 m depth, coarse sand and shell, coll. Allan Stoner, 18 Apr 1985, USNM 101447.

Description of new material.—Specimens incomplete; largest specimen with 72 segments, and 11.5 mm long, width at clitellum 0.20 mm. Prostomium partially retractable into II. Cuticle thick “dusted” with small adherent particles, segments of post-clitellar region with up to 35 fine annulations producing a “wavy” appearance. Clitellum not well developed. All setae bifid, 40–48 μm long, two per bundle in II–VIII with upper

tooth slightly thinner and subequal to lower, nodulus proximal (Fig. 3A). One seta per bundle posterior to VIII, upper tooth very reduced and lower tooth much thicker, nodulus median (Fig. 3B–C). Setae absent from XI. Male and spermathecal pores paired, in line with ventral setae. Spermathecal pores located far anteriorly in X.

Male genitalia paired. Vas deferens 160 μm long and thin walled, 7 μm wide, entering atrium apically. Atrium thin walled, more or less erect or obliquely directed posteriorly (Fig. 3D). Ampulla of atrium 65 μm long and 30–40 μm wide, thin walled, granulated. Two prostrates attached opposite each other on posterior and anterior face of atrial ampulla (Fig. 3D). Ectal duct of atrium 40 μm long and 10 μm wide, terminating in pseudopenis. Spermathecae composed of ectal duct 30 μm long, 10 μm wide, and oval ampulla 63 μm long, 43 μm wide (Fig. 3E). Sperm in random masses.

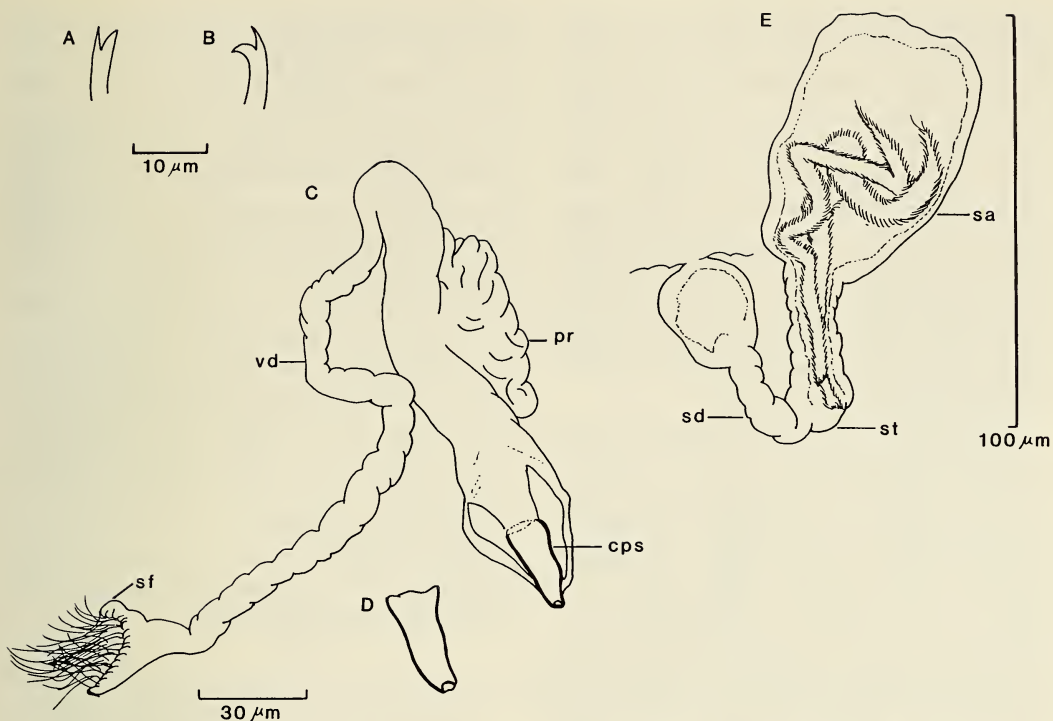


Fig. 4. *Tubificoides aguadillensis*: A, Seta from IV; B, Posterior seta; C, Male genitalia; D, Penis sheath; E, Spermatheca.

Remarks.—The new material conforms closely in all respects to the original description. Two other species of *Duridrilus* have been described by Erséus (1984, 1985). *Duridrilus tardus* differs from *D. piger* Erséus, 1984, described from Hong Kong, by possessing a thicker cuticle with fine secondary annulations, unisetal bundles posteriorly (bisetal in *D. piger*), and sperm not forming spermatozeugmata as in *D. piger*. *Duridulus tectus* Erséus, 1985, from Saudi Arabia has dorsally located spermathecal pores (ventral in *D. tardus*), no secondary cuticular annulations, and an extremely reduced upper tooth in posterior setae.

The presence of *D. tardus* in Puerto Rico was not unexpected. Erséus (1983b) predicted its occurrence throughout the Caribbean and more specimens are likely to be encountered as new areas in this region are explored.

Habitat and distribution.—Coarse sand,

8–39 m, known from Bermuda, Barbados, and Puerto Rico.

Subfamily Tubificinae
Tubificoides Lastochkin, 1937
Tubificoides aguadillensis, new species
 Fig. 4

Holotype.—Whole-mounted specimen, west coast of Puerto Rico, Aguadilla Bay, 2 km from shore, 17 m depth; mud with shell fragments, coll. Allan Stoner, 18 Apr 1985, USNM 101448.

Paratype.—One whole-mounted specimen, type locality, USNM 101449.

Etymology.—Named for the type locality.

Description.—Length 4.2 mm, 35 segments, width at XI 0.2 mm. Body wall naked. Bifid setae absent dorsally. Dorsal setae all smooth, straight hairs, 5–7 per bundle anteriorly, 50–109 μ m long generally alter-

nating from long to short within each bundle, posteriorly 3–5 hair setae per bundle, 50–70 μm long. Ventral setae all bifid, 3 per bundle to VIII, 50–60 μm long, thereafter 2 per bundle in all segments. Teeth of anterior ventral setae equal in length, upper tooth thinner than lower (Fig. 4A), posteriorly lower tooth slightly longer and much thicker than upper tooth (Fig. 4B). Unmodified ventral setae present in X. Male and spermathecal pores paired and in line with ventral setae. Spermathecal pores slightly anterior to ventral setae in X.

Male genitalia paired. Sperm funnel small leading into vas deferens, 210 μm long, 10 μm wide, ciliated throughout and entering atrium subapically. Compact prostate attached medially on atrium (Fig. 4C). Atrium tripartite, 98 μm long, 23 μm wide, composed of 1) an ental "cap" above the attachment of the vas deferens, 2) a central cylindrical ampulla, and 3) an enlarged ectal "penial bulb." Penis with somewhat conical cuticular penis sheath 30 μm long and 19 μm wide at base, tapering to blunt distal end with small terminal opening (Fig. 4D). Spermathecae with long duct, 30 μm long, 14 μm wide, terminating ectally in bulbous projection. Spermathecal ampulla ovoid, 100 μm long, 50 μm wide, joining ectally with spermathecal duct via "sperm trap" (Fig. 4E). Spermatozeugmata vermiform.

Remarks.—The species of *Tubificoides* are exclusively estuarine or marine. This is one of the largest genera of marine Oligochaeta and is now composed of 38 species. This genus was recently reviewed by Brinkhurst (1985, 1986). Twenty-seven species possess hair setae in at least some bundles. Although only two mature specimens were collected from Puerto Rico, they were significantly different enough from all congeners to warrant establishing them as a new species. *Tubificoides aguadillensis* is immediately distinguished from all congeners by the total lack of bifid setae in all dorsal bundles, the distinctive shape of the cuticular penis sheath and the short vas deferens. The only other species of *Tubificoides* lack-

ing bifid setae dorsally is one currently being described by Helgason and Erséus. However, the penis sheaths of their species differ from *T. aguadillensis* by having a conspicuous subapical spur, and the vas deferens of the former is much longer. Dr. M. Loden has reported a new species of *Tubificoides* which lacks dorsal bifid setae from the Gulf of Mexico (pers. comm.). The penis sheaths of his species and *T. aguadillensis* appear to be identical. The former species, however, differs from the latter in the following ways: 1) the prostate is attached entally on the atrium, 2) the body wall is papillated, 3) the upper tooth of the ventral crotchets is equal to or longer than the lower, and 4) the hair setae are bent.

Habitat and distribution.—Mud with shell fragments, 17 m depth, known only from Aguadilla Bay, Puerto Rico.

Tubificoides wasselli Brinkhurst and
Baker, 1979
Fig. 5

Pelosclex gabriellae Marcus, 1950, sensu Brinkhurst, 1965:133, figs. 5L–5N.—Brinkhurst and Simmons, 1968:187 (in partim).

Pelosclex gabriellae typica Brinkhurst and Cook, 1966:17 (in partim).

Tubificoides gabriellae (Marcus), sensu Brinkhurst and Baker, 1979:1556 (in partim).

Tubificoides gabriellae (Marcus), Brinkhurst, 1979:7.

Tubificoides wasselli Brinkhurst and Baker, 1979:1556, fig. 1.—Brinkhurst, 1986:1276–1278, fig. 5.

Tubificoides foliatus Baker, 1983:1274–1276, fig. 5.

not *Tectidrilus gabriellae* (Marcus), Erséus, 1982:25–258.

Material examined.—Two whole-mounted specimens, west coast of Puerto Rico, Aguadilla Bay, 2 km from shore, 39 m depth, silt-clay, with pockets of detritus, coll. Allan Stoner, 14 May 1985, USNM 101450.

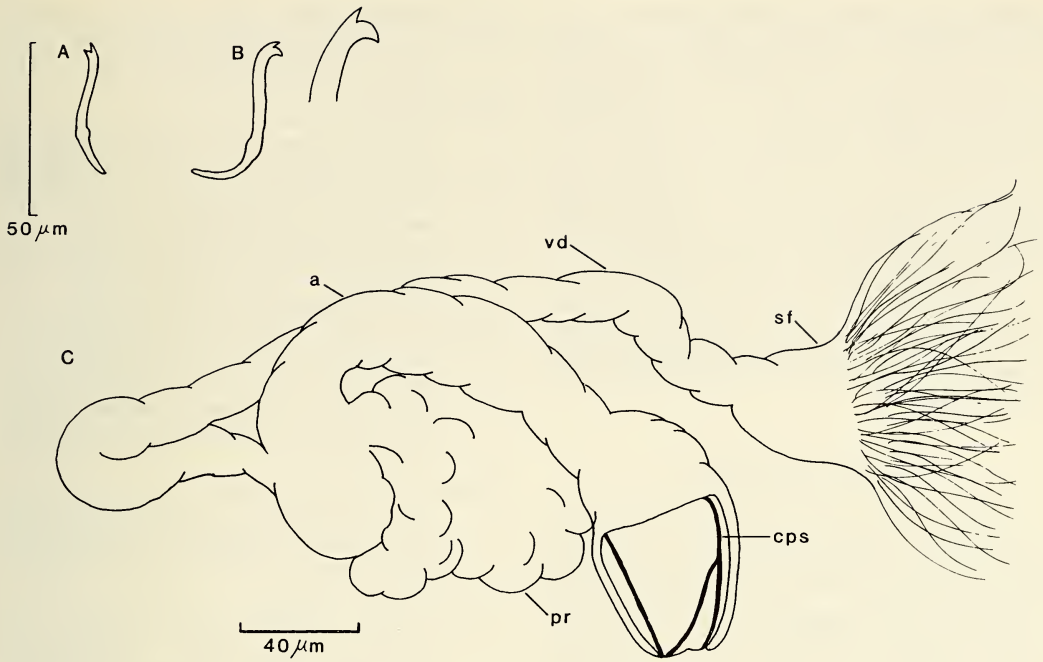


Fig. 5. *Tubificoides wasselli*: A, Seta from VII; B, Seta from VIII; C, Male genitalia.

Description of new material.—Specimens incomplete. Largest specimen with 20 segments, length 3.3 mm, width at XI 0.26 mm. Prostomium and II retractile. Body wall densely covered with large papillae from IV. All setae bifid, 2 per bundle to VII, about 45 μm long, upper tooth shorter and thinner than lower (Fig. 5A). From VIII one seta per bundle, about 52 μm long, upper tooth very reduced, lower tooth thick and recurved (Fig. 5B). Setae absent from XI. Modified genital setae absent. Spermathecal and male pores paired, in line with ventral setae. Clitellum not observed.

Male genitalia paired. Vas deferens of uniform width, 15 μm , and 370 μm long, ciliated internally with thin walls, entering atrium subapically. Prostate large, compact, entering atrium opposite vas deferens. Atrium tripartite, 170 μm long, maximally 29 μm wide, composed of 1) ental cap-like region, 2) muscular tubular middle portion, and 3) ectally a bulbous penial apparatus with cuticular penis sheath (Fig. 5C). Penis sheath conical with shovel-shaped opening,

40 μm long and 40 μm wide at base. Spermathecae paired, duct elongate 170 μm , 20 μm wide, ampullae sacciform, 70 μm long, 55 μm wide. Spermatozeugmata not observed.

Remarks.—*Tubificoides wasselli* has been the subject of much confusion. Erséus (1982) found that the type specimens of *Peloscolex gabriellae* (sensu Marcus) should actually be in the genus *Tectidrilus* Erséus, 1982, because of the presence of gut diverticula and absence of a cuticular penis sheath. Therefore, specimens attributed to *Tubificoides gabriellae* without the above criteria needed to be reexamined. Baker (1983) described a new species, *Tubificoides foliatus*, and presented an extensive discussion concerning the synonymy of it and specimens originally attributed to *Tubificoides gabriellae*. Apparently, many previous studies on the northwest coast of North America combined *T. foliatus* with *T. gabriellae*. *Tubificoides foliatus* was originally separated from *T. wasselli* solely by the relative size of the genitalia. New material from Florida, ex-

amed by Brinkhurst, was found to be intermediate between the two species. Based on this, Brinkhurst (1986) has now synonymized *T. foliatus* with *T. wasselli*. The material from Puerto Rico more closely approximates the diminutive size of the genitalia of the "*foliatus*" form. This new record from Puerto Rico increases the known range into the Caribbean.

Habitat and distribution.—Sand and mud, intertidal to 60 m depth, Delaware to Florida, British Columbia to California, and Puerto Rico.

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